Invacare® Bora / Spectra XTR
SERVICE MANUAL

These instructions contain information about:
testing work
repair work
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1 Introduction

1.1 General information

- Service and maintenance work must be carried out taking this service manual into account.
- It is imperative that you observe safety information.
- Information about operation or about general maintenance and care work on the mobility device should be taken from the operating manual.
- You can find information about ordering spare parts in the spare parts catalogue.
- Only use original Invacare® spare parts. The guarantee will become invalid if other spare parts are used!
- We reserve the right to make any alterations on the grounds of technical improvements.
- The mobility device may only be maintained and overhauled by qualified personnel.
- The minimum requirement for service technicians is suitable training, such as in the cycle or orthopaedic mechanics fields, or sufficiently long-term job experience.
  - Experience in the use of electrical measuring equipment (multimeters) is also a requirement.
  - Special Invacare training is recommended.
- Alterations to the mobility device which occur as a result of incorrectly or improperly executed maintenance or overhaul work lead to the exclusion of all liability on the side of INVACARE.
- If you have any problems or questions please contact Invacare Service.
-

1.2 Notes on transport

- If the mobility device has to be shipped back to the manufacturer for major repairs, you should always use the original packaging for transport.
- You must include a precise fault description.

1.3 Important symbols in this manual

WARNING!

This symbol warns you of danger!

- *Always follow the instructions to avoid injury to the user or damage to the product*!

EXPLOSION HAZARD!

This symbol warns you of an explosion hazard, which can be caused by excessive tyre pressure in a pneumatic tyre!

- *Always follow the instructions to avoid injury to the user or damage to the product*!

BURN HAZARD!

This symbol warns against chemical burns, for example due to the discharge of battery acids!

- *Always follow the instructions to avoid injury to the user or damage to the product*!

NOTE:
This symbol identifies general information which is intended to simplify working with your product and which refers to special functions.

Requirements:

- This symbol identifies a list of various tools, components and items which you will need in order to carry out certain work. Please do not attempt to carry out the work if you do not have the listed tools available.

2 Safety and fitting instructions

These safety instructions are intended as prevention of accidents at work and it is imperative that they are observed.

2.1 Before any inspection or repair work

- Read and observe this repair manual and the associated operating manual!
- Observe the minimum requirements for carrying out the work (see chapter entitled " General information").

2.2 General safety information and information about fitting / removal

Danger of crushing!
- *Please note the high weight of some components*! *This applies especially to removal of drive units and batteries!*

Fire and burn hazard due to electrical short-circuit!
- *The mobility device must be switched off before removal of voltage-carrying components! The batteries must be removed to do this!*
- *When carrying out measurements on voltage-carrying components, avoid short-circuiting the contacts! Fire and burn hazard!*

Injury hazard and danger of damage to vehicle due to improper or incomplete maintenance work!
- *Use only undamaged tools in good condition*.
- *Some moving parts are mounted in sockets with PTFE coating (Teflon™). These sockets must on no account be greased!*
- *Never use "normal" nuts instead of self-locking nuts!*
- *Always use correctly-dimensioned washers and spacers!*
- *Cable ties which have been cut during removal must be replaced during refitting!*
- *After completing your work / before renewed start-up of the mobility device, check all connections for tight fitting. Check all parts for correct interlocking.*
- *Only operate the vehicle with the approved tyre pressures (see technical data)!*
- *Check electrical components for correct functioning - incorrect polarity can result in damage to the electronic system!*
- *Always carry out a trial run when your work is finished!*

Note
Mark all current settings for the mobility device (seat, armrests, backrest etc.), and the associated cable connecting plugs, before dismantling. This makes reassembly easier.
All plugs are fitted with mechanical safety devices which prevent release of the connecting plugs during operation. To release the connecting plugs the safety devices must be pressed in. When reassembling ensure that these safety devices are correctly engaged.

CAUTION: any changes to the drive program can affect the driving characteristics and the tipping stability of the vehicle!
- *Changes to the drive program may only be carried out by trained Invacare® specialist dealers!*
- *Invacare® supplies all mobility devices with a standard drive program ex-works. Invacare® can only give a warranty for safe vehicle driving behaviour - especially the tipping stability - for this standard drive program!*

3 Tightening torques

The tightening torques stated in the following list are based on the thread diameter for the nuts and bolts for which no specific values have been determined.All values assume dry and de-greased threads.

Thread	M4	M5	M6	M8	M10	M12	M14	M16
Tightening torque in Nm ±10%	3 Nm	6 Nm	10 Nm	25 Nm	49 Nm	80 Nm	120 Nm	180 Nm

Caution:**!**
Any other nuts or plastic connections not listed here must be tightened FINGER-TIGHT!

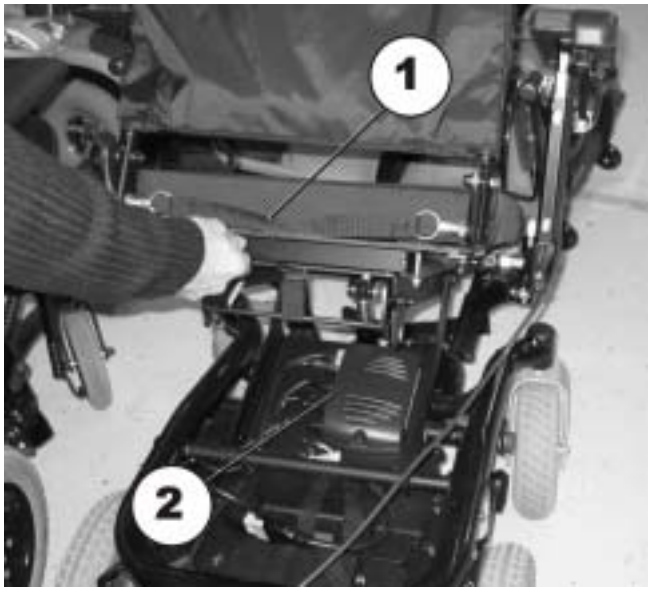
4 Layout of components and componentry

4.1 Overview

Underneath the seat:

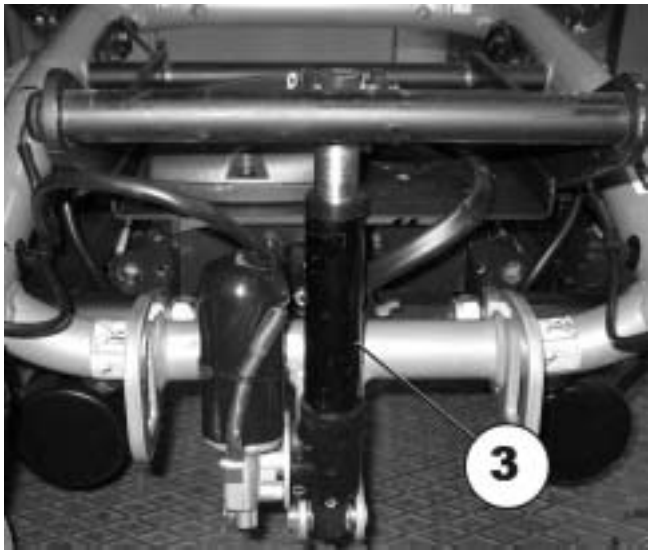
1) Seat disengager
2) Electronics module

The electronics modules used are described in Chapter 4.2.



Power seat tilting

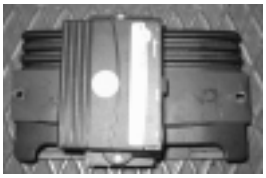
3) Adjusting motor

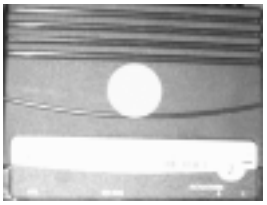


4.2 Electronics modules

A variety of electronics modules can be fitted to the mobility device.

Before you connect any mobility device components such as adjusting motors/actuators or motors to the electronics modules, you should first ensure that you know exactly which electronics module has been fitted. Please refer to the following table for an overview.

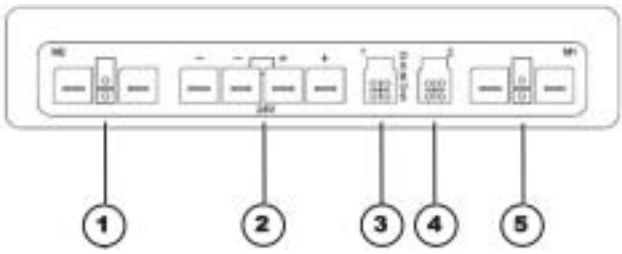
Electronics module	Designation	Joystick boxes	Notes
	ACS I 60A	REM24 remote	
	ACS I 60A with ACT actuator module		The actuator module is optional.
	ACS II 70A	REM24 remote	
	ACS II 70A with ACT actuator module		The actuator module is optional.
	VR2	VR2 remote	
	Shark	Shark II remote	
	Shark with lighting PCB		The lighting PCB is optional.

Electronics module	Designation	Joystick boxes	Notes
	ACT actuator module		The actuator module is optional.
	Lighting PCB		The lighting PCB is optional.

4.2.1 ACS I 60A electronics module

Connections

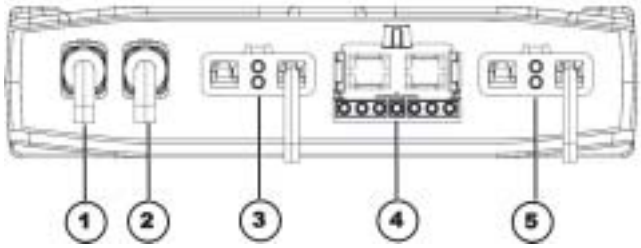
1) Motor M2
2) Battery 24V
3) Bus cable (to remote or ACT)
4) Bus cable (to remote or ACT)
5) Motor M1



4.2.2 ACS II 70A electronics module

Connections

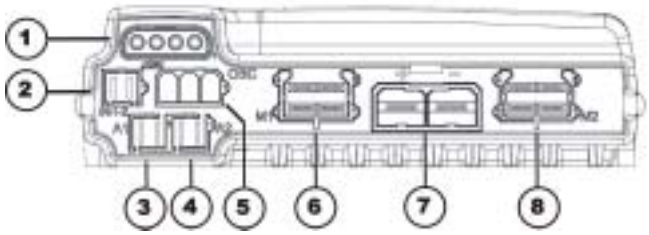
1) Bus cable (to remote or ACT)
2) Bus cable (to remote or ACT)
3) Motor M1
4) Battery 24V
5) Motor M2



4.2.3 VR2 electronics module

Connections

1) Joystick box
2) Lock (INHIBIT 2)
3) Actuator 1
4) Actuator 2
5) On-board battery charger
6) Motor M1
7) Battery 24V
8) Motor M2

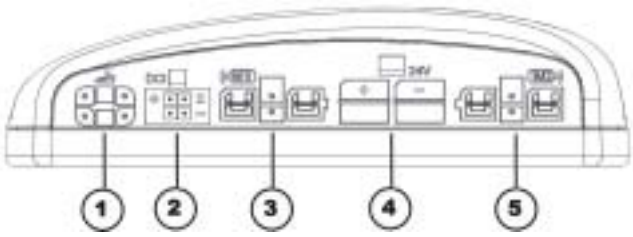


4.2.4 Shark electronics module

4.2.4.1 Shark with 4-pole DCI

Connections

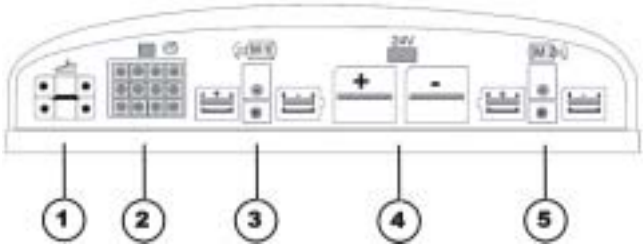
1) Joystick box
2) DCI for actuators (4-pole)
3) Right-hand motor M1
4) Battery 24V
5) Left-hand motor M2



4.2.4.2 Shark with DCI 12-pole

Connections

1) Cable to remote
2) DCI for actuators/lighting (12-pole)
3) Right-hand motor M1
4) Battery 24V
5) Left-hand motor M2



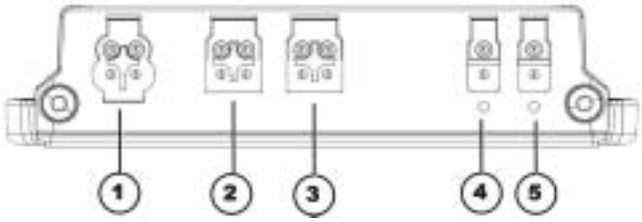
4.2.5 ACT actuator module

A range of adjusting motors, also known as actuators, can be fitted to the mobility device. These actuators are either connected directly to the electronics module or to a separate actuator module. The actuator module is connected with the electronics module via a bus cable.

4.2.5.1 ACT 2 actuator module

Connections

1) ACI*
2) Bus cable (to remote or ACT)
3) Bus cable (to remote or ACT)
4) Adjusting motor/actuator - Channel 2
5) Adjusting motor/actuator - Channel 1

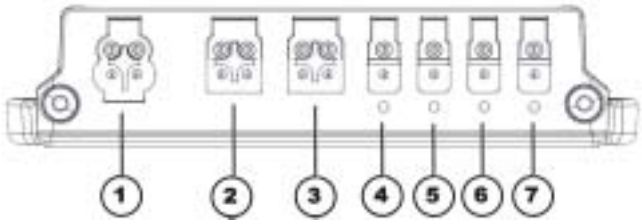


* The ACI connection is used for actuator limitation or speed reduction.

4.2.5.2 ACT 4 actuator module

Connections

1) ACI*
2) Bus cable (to remote or electronics module)
3) Bus cable (to remote or electronics module)
4) Actuator - Channel 4
5) Actuator - Channel 3
6) Actuator - Channel 2
7) Actuator - Channel 1



* The ACI connection is used for actuator limitation or speed reduction.

4.2.6 Lighting PCB

The lighting PCB connections are printed on the circuit board itself.

5 Maintenance plan (1x annually)

Component	Check	Remedy	Notes	✓
Armrests	• Damage to armrests	• Replace covering if damaged		
	• Armrest fixings	• Tighten screws		
Side panels	• Damage to side panels	• Replace side panels if damaged		
	• Side panel fixings	• Tighten screws		
Seat lock	• Seat lock defective	• Replace seat lock		
Seat angle adjustment	• Tight seating of SL fuses	• Replace SL fuses if necessary		
Power backrest (if fitted)	• Damage to backrest • Seams • Fixing • Check cable • Check function	• Replace parts if damaged • Tighten screws • Replace cable motor if necessary		
Frames (chassis) / battery mounting	• Check fixings, welded seams and battery mounting	• Tighten screws • Replace components if necessary		
Wheel suspension and wheels	• Check drive wheels for tight fit and side play	• Adjust, replace wheel hubs	See chapter 7.11.	
	• Check steering wheels for tight fit, float and side play	• Replace wheels, wheel fork or wheel bearings	See chapter 7.9.	
	• Pneumatic tyres (if fitted)	• Repair or replace if damaged	See chapter 7.10.	
Drive units, coupling mechanism	• Check functions in drive and push modes • Check coupling mechanism	• Replace motor if necessary. • Tighten screws/nuts, adjust or replace if necessary		
Legrests	• Check welded seams, interlocking, screws, footplates	• Tighten, replace if necessary		
Power legrests (if fitted)	• Check cable • Check contacts • check functions	• Replace cable if necessary		
Lighting (if fitted)	• Check cable • Check function	• Replace lamp or cable if necessary		
Batteries	• Check batteries for damage	• Replace batteries if necessary	See chapter 7.5.	
	• Check battery voltage	• Charge batteries	See operating manual	
	• Check contacts and terminals	• Clean contacts and terminals	Please refer to the safety information in Chapter 7.5 for handling batteries	

Component	Check	Remedy	Notes	✓
Battery case	• Check locking system, it must engage completely.	• Replace if necessary		
Remote / electronics module	• Remote, status display blinking	• Evaluate error/blink code		
	• Fixings	• Tighten fixings, replace if necessary		
	• Cables and connecting plugs	• Tighten cables and connecting plugs, replace if necessary		
	• Drive lever function	• Replace drive lever if necessary • Replace remote if necessary		
	• Power supply	• Tighten cables and connecting plugs, replace if necessary		
Drive program	• Check drive electronics program version	• Update software if newer version available.	See chapter 7.4.	

6 Operational faults

The various electronics modules can be fitted in connection with differing remotes in the mobility device. Rectification of operational faults is dependent on the electronics module fitted.

The electronics modules used are described in Chapter 4.2.

NOTE:
The tables for rectification of operational faults listed in the following chapters are only an excerpt from the original manufacturer's manuals.
You can obtain the original manuals from Invacare®.

If you have problems with the mobility device, please proceed as follows:

- First assess the possible cause of the problem using the following table.
- Check the remote status display. Evaluate the error code.
- Carry out the necessary checks and repairs as recommended in the following table.

6.1 Drive fault diagnosis

PROBLEM	OTHER SYMPTOMS	POSSIBLE CAUSE	SOLUTION	Documentation
Mobility device will not start	The remote status display illuminates normally and does not show an error code.	Drive motors disengaged	Engage drive motors	See operating manual
	Remote status display does not illuminate	batteries defective	Replace batteries	See chapter 7.5.
		Completely discharge battery	Pre-charge batteries	See operating manual
		Power supply to remote interrupted	Check master fuse	See chapter 7.3.
			Check cables between the modules for loose connections and damage	See chapter 7.7.
		Remote defective	Replace remote	See chapter 7.8.
	Remote status display blinking	Various causes	Assess error code	See chapter 6.2.

PROBLEM	OTHER SYMPTOMS	POSSIBLE CAUSE	SOLUTION	Documentation
Mobility device judders in drive mode	None	Batteries defective (unstable voltage)	Replace batteries	See chapter 7.5.
		Drive motor(s) defective	Replace motor(s)	See chapter 7.2.
			Replace carbon brushes	See chapter 7.2.4.
Batteries not being charged	None	Batteries defective	Replace batteries	See chapter 7.5.
	LEDs blinking on charging unit	Charging unit defective	Replace charging unit	See charging unit operating manual
Mobility device runs too slowly	None	Remote defective	Replace remote	See chapter 7.8.
		Batteries defective	Replace batteries	See chapter 7.5.
Electrical adjustment motor does not react	Remote shows a blinking "E", status diode on lighting/actuator module does not go out even if remote is switched off or disconnected.	Lighting / actuator module defective	Replace lighting / actuator module	See chapter 7.3.
	None	Cable disconnected or damaged	Safeguard cable connection, replace cable if necessary	See chapter 7.7.
		Electrical adjusting motor defective	Check adjusting motor	See chapter 7.12.
		Remote defective	Replace remote	See chapter 7.8.

6.2 REM24 remote: Error codes and diagnostic codes

The drive electronics can automatically rectify some faults. In this case the status display will stop blinking. Switch the remote on and off again several times. Wait around 5 seconds each time before switching the remote on again. If this does not rectify the fault, determine the cause using the blink codes from the following table.

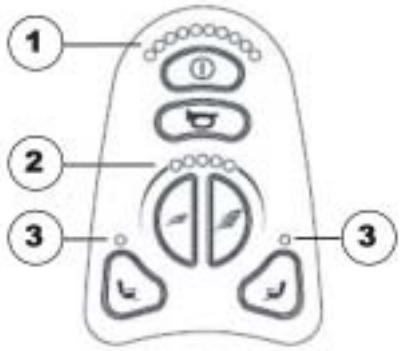
Blink Code	POSSIBLE CAUSE	SOLUTION	Documentation
1 x blink	Module defective	Replace defective module	See chapter 7.3.
2 x blink	Accessory error (e.g. short-circuit in adjusting motor)	Check accessory connections, check accessory	See chapter 7.12.
	Lifter too high or too low (seat not at driving height)	If the lifter is raised, lower it slowly until the status display stops blinking. If the lifter is too low, raise it slowly until the status display stops blinking. Only drive when the seat is at driving height.	See operating manual
3 x blink	Error at right-hand motor Connection loose/defective or motor defective	Check connection plug, check motor	See chapters 7.7 and 7.2
4 x blink	Error at left-hand motor Connection loose/defective or motor defective	Check connection plug, check motor	See chapters 7.7 and 7.2
5 x blink	Fault/brake fault on right-hand motor. Connection loose/defective or motor defective	Check connection plug	See chapters 7.7 and 7.2
6 x blink	Fault/brake fault on left-hand motor. Connection loose/defective or motor defective	Check connection plug	See chapters 7.7 and 7.2
7 x blink	Completely discharge battery	Pre-charge battery	See operating manual
8 x blink	Battery voltage too high	Switch lighting to low battery voltage Check battery charger	See charging unit operating manual
9 or 10 x blink	Faulty data transmission between modules	Remove electronic modules except for the power module and the remote. Replace the modules one after another in order to ensure which was the one causing the fault.	See chapter 7.3.
11 x blink	Drive motors overloaded / overheated	Switch remote on and off / wait if necessary	-
12 x blink	Compatibility problems between modules	Remove incorrect module	See chapter 7.3.

6.3 VR2 remote: Error codes and diagnostic codes

Evaluate the cause using the following blink codes. The following figure shows which LEDs are located on the remote.

- The figure shows which LEDs are located on the remote.

1) Battery display
2) Profile indicator
3) Adjusting motors



Error code	POSSIBLE CAUSE	SOLUTION	Documentation
1 LED battery display	Batteries discharged	Charge battery Check cable to batteries	See chapter 7.7.
2 LED battery display	Error at left-hand motor Connection loose/defective or motor defective	Check connection plug, check motor	See chapters 7.7 and 7.2
3 LED battery display	Short-circuit in left-hand motor	Check connection plug, check motor	See chapters 7.7 and 7.2
4 LED battery display	Error at right-hand motor Connection loose/defective or motor defective	Check connection plug, check motor	See chapters 7.7 and 7.2
5 LED battery display	Short-circuit in right-hand motor	Check connection plug, check motor	See chapters 7.7 and 7.2
6 LED battery display	The mobility device has been blocked by an external signal, for example because the charger is connected.	Remove battery charger	
7 LED battery display	Fault on drive lever	Put the drive lever in a central position before switching the remote on.	
8 LED battery display	Fault in the electronics	Check cable	See chapter 7.7.
9 LED battery display	The parking brake is not working correctly.	Check parking brake Check cable.	See chapter 7.7.
10 LED battery display	Power surges in the control box, e.g. due to bad connection with batteries.	Check cable to batteries	See chapter 7.7.
7 LED Battery display plus 5 LED profile indicator	Compatibility problems between modules	Check cable to remote Replace remote	See chapter 7.7.

Error code	POSSIBLE CAUSE	SOLUTION	Documentation
8 LED Battery display plus 2 LED actuators	Actuator error;	if more than one actuator is fitted, locate the defective actuator. Check cable to actuator	 See chapter 7.7.

6.4 Shark II remote Error codes and diagnostic codes

The drive electronics can automatically rectify some faults. In this case the status display will stop blinking. Switch the remote on and off again several times. Wait around 5 seconds each time before switching the remote on again. If this does not rectify the fault, determine the cause using the following link codes:

Blink Code	MEANING	SOLUTION	Documentation
1	Operating error	Set drive lever to neutral central position (just release drive lever) and switch on again	
2	Battery error	Check battery and mains cable	See chapter 7.7.
		Charge batteries. If you switch the mobility device off for a few minutes, the batteries can often charge themselves up enough to enable a short journey. You should, however, only use this solution in emergency situations because it results in excessive battery discharging.	See operating manual
		Replace batteries	See chapter 7.5.
3	Fault on left-hand motor (M2)	Check motor cable and connecting plug. Check motor.	See chapters 7.5 and 7.2
4	Fault on right-hand motor (M1)	Check motor cable and connecting plug. Check motor.	See chapters 7.5 and 7.2
5	Fault at left-hand (M2) motor brake	Check cable and plug.	See chapter 7.5.
6	Fault right-hand (M1) motor brake	Check cable and plug.	See chapter 7.5.
7	Error in Shark remote	Check bus cable in remote and connecting plug. Replace remote.	See chapter 7.5.
8	Error in Shark power module	Check all the cables and plugs in the Shark system. Replace electronics module	See chapters 7.5 and 7.3
9	Communication error in Shark system	Check all cables and connecting plugs in the Shark system. Replace remote.	See chapters 7.5 and 7.3
10	Unknown error	Check all cables and connecting plugs.	See chapter 7.5.
11	Incompatible remote	The wrong remote has been connected. Ensure that electronic module code and the remote code match.	See chapter 7.3.

7 Repair work

7.1 General warning information about fitting work

CAUTION: Danger of damage to vehicle! Collisions can be caused if the adjusting washers are removed during fitting work to the drive wheels!

- *Adjusting washers are often fitted between the drive shaft and the wheel hub to even out tolerances. If these adjusting washers are removed and not replaced again, collisions can be caused! Always replace the adjusting washers exactly as they were before you started dismantling!*

7.2 Replacing drive components

CAUTION! Tipping and crushing hazard!

- *Remove the seat and place the mobility device upside down so that the wheels are facing upwards! This guarantees mobility device stability during repair work!*
- *You should seek help from a second person!*
- *Please see the following work steps for further important information.*

CAUTION: Fire and burns hazard if battery terminal is bypassed!

- *When replacing batteries, the battery terminals may not come into contact with mechanical mobility device components and be short-circuited!*
- *Always replace battery terminal caps after replacing the batteries!*

Requirements:

- small flat screwdriver
- Torx TX40 spanner
- Allen key 5 mm
- oblique pliers
- Cable binder

NOTE:
When disassembling, take care of small parts such as screws and washers. Put all small parts down so that they can be reassembled in the right sequence.

- Remove legrests.
- Release seat (1) and tilt forwards.
- Disconnect the remote bus cable from the electronics module or ACT.
- Lift the seat out of the front anchorage and remove it. When doing so, get the help of a second person because the seat is heavy.

- Remove both battery cases as described in Chapter 7.5.1.
- Disconnect the motor plug from the motor to be replaced from the electronics module.
- The motor cable is secured inside the frames with cable ties. Remove the cable ties with the oblique pliers.
- Place the vehicle upside down so that the wheels are facing upwards. When doing so, get the help of a second person because the vehicle is heavy.

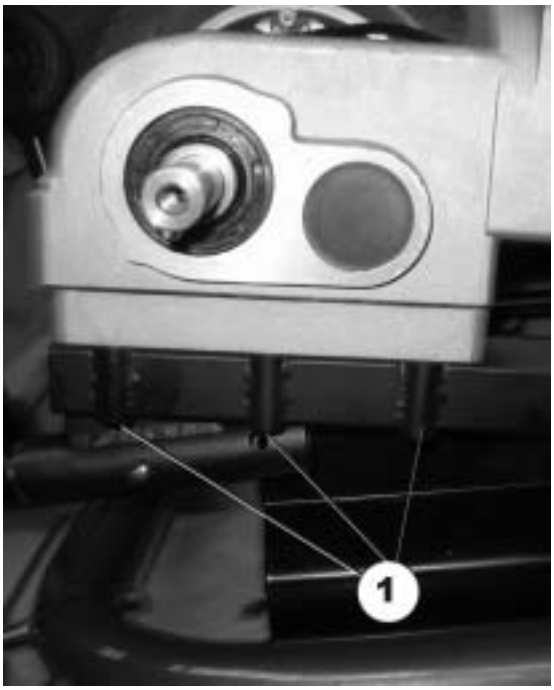
- Remove the torx screw (1) with a TX40 spanner.
- Remove the screw and hubcap.
- Pull the complete wheel off the wheel hub.

7.2.1 Replacing the complete drive unit

- Loosen the six drive unit screws with the 6 mm Allen key.

  3 screws are located on the outside of the drive unit as shown in the figure.

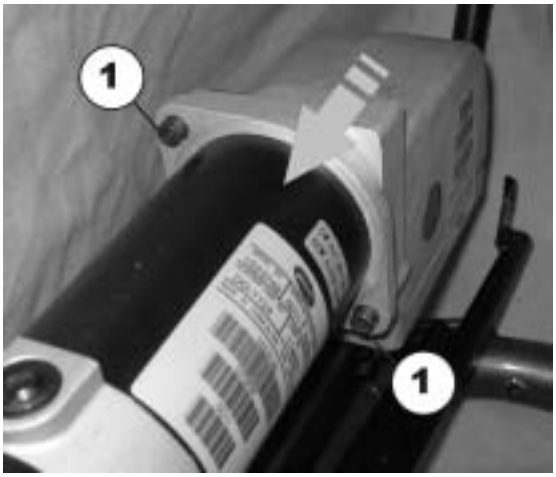
  The other 3 screws are located on the inside of the drive unit.
- Lift the complete drive unit up.



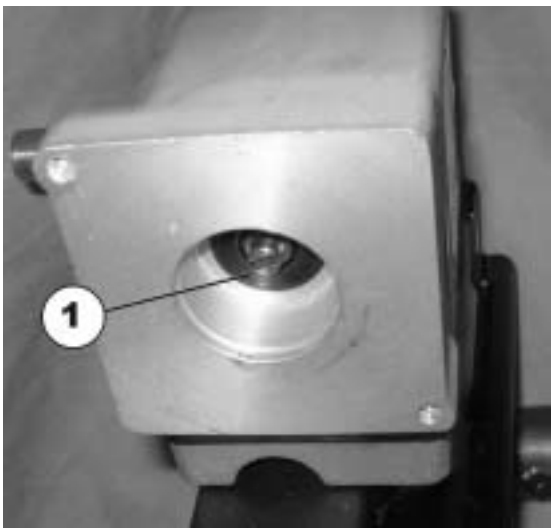
- The drive unit is reassembled in reverse order to disassembly.

7.2.2 Replacing the motor

- Loosen the motor screw (1) with the 5 mm Allen key.
- Remove the motor from the transmission.

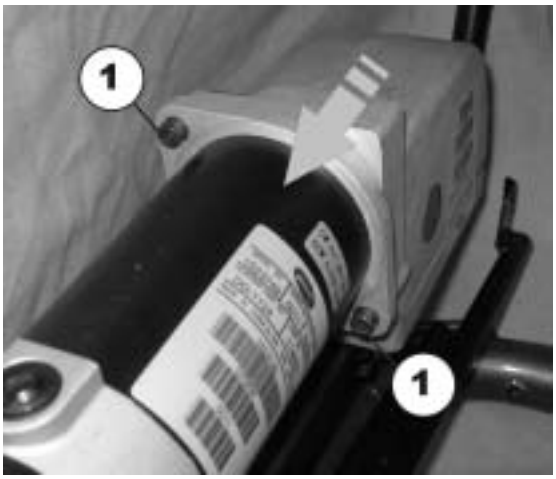


- The motor is reassembled in reverse order to disassembly.
- The motor must be carefully inserted into the transmission to avoid damage. Observe the position of the groove (1) in the transmission.
- The cable must be routed so that it does not rub or get trapped.
- Insert the motor plug into the electronics module.
- Secure the motor cable to the frame with cable ties.

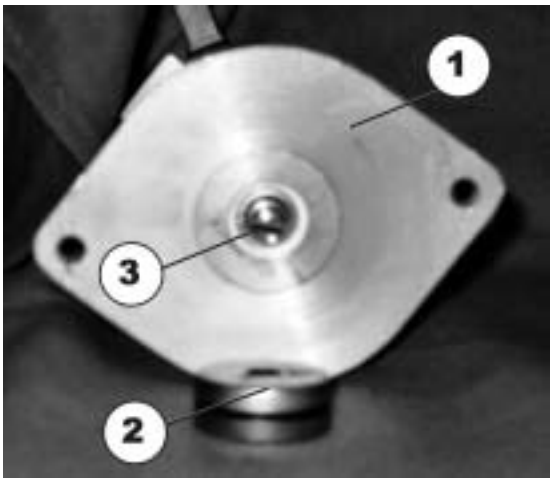


7.2.3 Replacing the jaw clutch

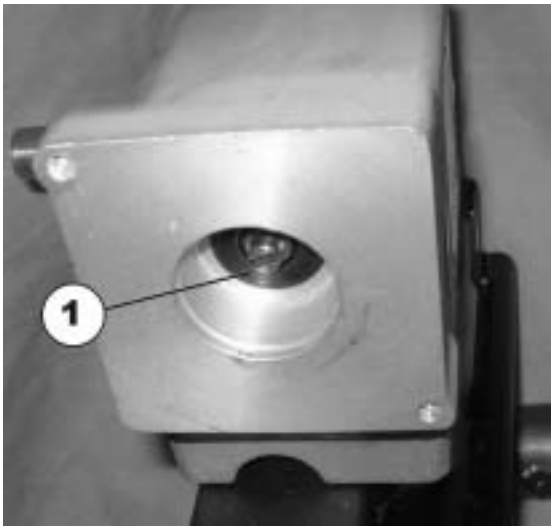
- Loosen the motor screw (1) with the 5 mm Allen key.
- Remove the motor from the transmission.



- Remove the clutch (2) from the motor (1) using the screwdriver
- Place a new clutch on the motor. Observe the position of the groove (3) on the motor.



- The motor is reassembled in reverse order to disassembly.
- Insert the motor carefully into the transmission to avoid damage. Observe the position of the groove (1) in the transmission.
- The cable must be routed so that it does not rub or get trapped.
- Insert the motor plug into the electronics module.
- Secure the motor cable with cable ties.

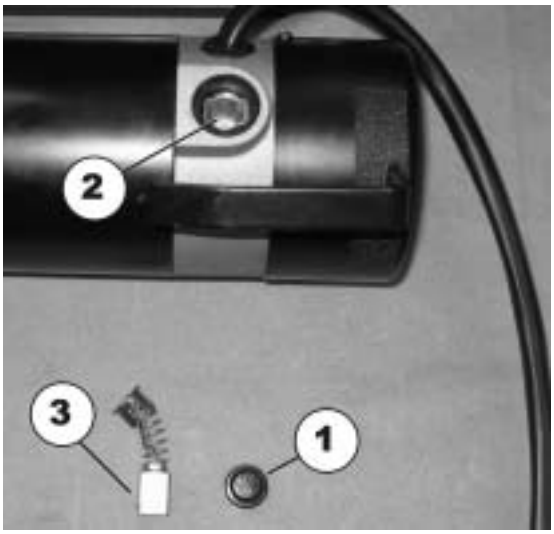


7.2.4 Replace carbon brushes

NOTE:
The carbon brushes are located under plastic caps outside each motor. This makes them easily accessible so that they can be replaced without removing the motor.
Always replace the carbon brushes on both motors.

- Carefully remove the plastic cap (1) on the motor with the screwdriver.

- Remove the plastic cap (1) and the carbon brushes (3).
- Insert new carbon brushes (3) through the openings (2) on the motors. In doing so, the spring must face upwards.
- Carefully screw in the plastic cap (1) on the motor with the screwdriver.



7.3 Replacing the electronics

The various electronics modules can be fitted to the mobility device with a range different remotes . The possible electronics modules are described in Chapter 4.2.

Replacement is described below using the Shark electronics module as an example. The course of action is the same for other electronics modules. The only difference is the terminal layout.

CAUTION: any changes to the drive program can affect the driving characteristics and the tipping stability of the mobility device!

- *Changes to the drive program may only be carried out by trained Invacare® specialist dealers!*
- *Invacare® can only give a warranty for safe mobility device driving behaviour - especially the tipping stability - for unaltered standard drive programs!*

NOTE:
All electronics modules are delivered with a standard drive program. If you have carried out customer-specific modifications to the drive program, you will have to make these changes again after installing the new electronics module.

Requirements:

- Phillips screwdriver
- To adapt the drive program:
  programming software or hand programming device and system installation manual, available from Invacare®.

- Remove legrests.
- Release seat (1) and tilt forwards.
- Disconnect the remote bus cable from the electronics module or ACT.
- Lift the seat out of the front anchorage and remove it. When doing so, get the help of a second person because the seat is heavy.

- Remove all plugs (1) from the electronics module.
- Mark the positions of individual plugs for later reassembly.

- Loosen the screws (1) on both sides of the electronics module with the Phillips screwdriver and remove them.
- Remove the electronics module.

- Reassembly of the electronics module takes place in reverse order.
- Update the drive program if a new software version is available as described in Chapter 7.4.
- Adapt the drive program using the programming software if necessary.
- To complete, check all vehicle functions.

7.4 Updating software

The drive programs for mobility devices are continually being further developed and improved by Invacare. For this reason, you should always check whether the drive program version number is up-to-date when carrying out any repairs or regular maintenance.

If a newer version is available, the drive program should be updated. The procedure for updating the drive program is described in the wizard software operating manual.

NOTE:
If you have carried out customer-specific modifications to the drive program, you will have to make these changes again after installing the new drive program.

CAUTION: any changes to the drive program can affect the driving characteristics and the tipping stability of the mobility device!

- *Changes to the drive program may only be carried out by trained Invacare® specialist dealers!*
- *Invacare® can only give a warranty for safe mobility device driving behaviour - especially the tipping stability - for unaltered standard drive programs!*

Requirements:

- Dynamic® Wizard software
- Operating manual for Wizard software
- Further requirements, such as a minimum system configuration for the PC used for programming, required programming cables etc. can be taken from the Wizard software operating manual.

7.5 Replacing batteries

CAUTION:

Injury hazard if battery is not correctly handled during assembly and maintenance work!

- *The installation of new batteries may only be carried out by authorised specialists!*
- *Observe the warning information on the batteries!*
- *Bear in mind that the batteries are very heavy!*
- *Only use battery versions stated in the specifications!*

Fire and burns hazard if battery terminal is bypassed!

- *Do NOT bridge battery terminals with tools!*

CAUTION:

discharging acid can cause skin burns if the battery is damaged:

- *immediately change contaminated or soaked clothing!*

If contact with skin is made:

- *wash off immediately with plenty of water!*

If contact with eyes is made:

- *rinse eyes out under running water for several minutes immediately; call a doctor!*

7.5.1 Removing the battery cases

CAUTION! Danger of crushing!

- *The batteries are extremely heavy. Please ensure that they do not fall to the ground when they are removed from the chassis.*

NOTE:
A spare fuse is located behind the Invacare logo on the rear battery.

- Pull the rear battery case backwards using the belt. The locking device opens automatically when doing so.

- Pull the battery cases out using the side handles.

- Pull the front battery case backwards using the belt and pull it out using the handles.

7.5.2 Removing the batteries

CAUTION: Fire and burns hazard if battery terminal is bypassed!

- *When replacing batteries, the battery terminals may not come into contact with mechanical mobility device components and be short-circuited!*
- *Always replace battery terminal caps after replacing the batteries!*

CAUTION! Danger of crushing!

- *The batteries are extremely heavy. Please ensure that they do not fall to the ground when they are removed from the chassis.*

Requirements:

- Phillips screwdriver

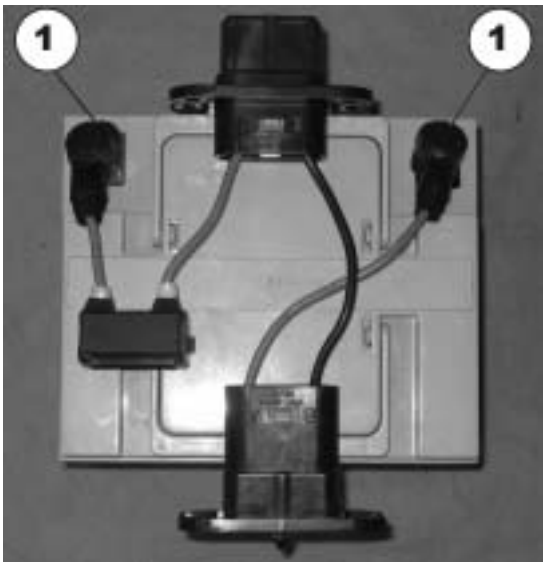
- Bend the tabs (1) on the cover lightly to the outside and loosen the battery case covers.

- Open the battery case (remove cover).

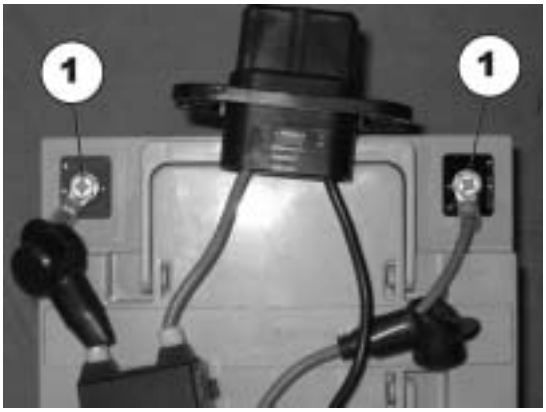
- Pull the battery case socket / plug out of the guide.
- The rear battery is only fitted with a battery case socket at the front.
- The front battery is fitted with a battery case socket at the front (flange central) and with a battery case plug at the rear (flange flush).
- Note the fixing position of the battery and the battery case sockets/plugs. The new battery must be refitted in exactly the same position as the old one.

- The batteries can be pulled upwards out of the battery cases by their handles.

- Remove the terminal cover from the battery terminals (1).

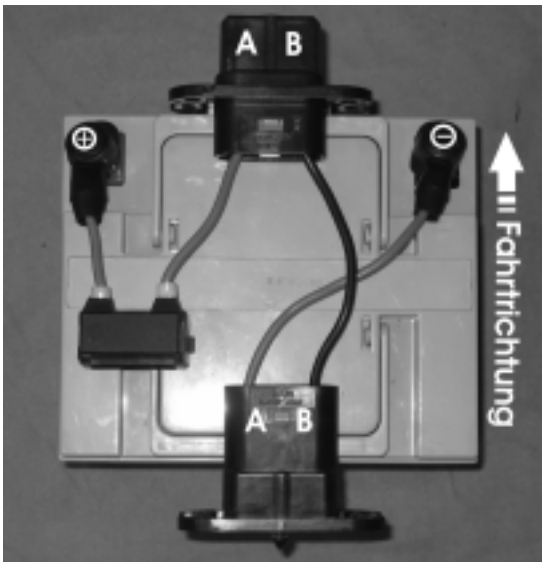


- Loosen the battery terminal clamps (1) with the Phillips screwdriver.
- First undo the screw on the negative terminal (black cable) with the Phillips screwdriver.
- After this, undo the bolt on the positive terminal (red cable).

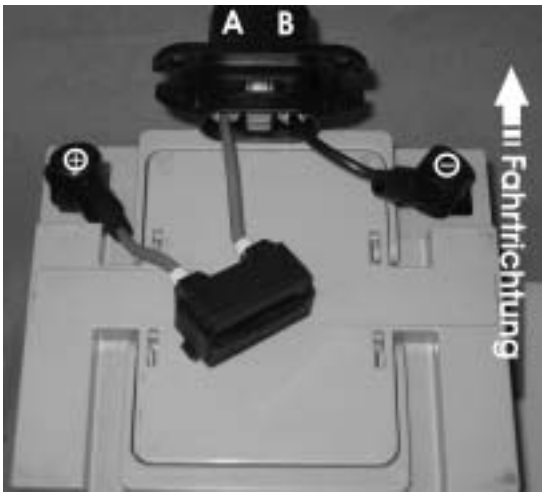


- Reassembly of the batteries takes place in reverse order
- Ensure that the battery cage sockets/plugs have been correctly refitted. A polarity diagram is located in each battery case cover.

- **Front battery**
- The battery case socket is located at the front (flange central).
- Socket side A is on the left in the direction of travel.
- Socket side B is on the right in the direction of travel.
- The battery case plug is located at the rear (flange flush).
- Plug side A is on the left in the direction of travel.
- Plug side B is on the right in the direction of travel.



- **Rear battery**
- The battery case socket is located at the front (flange central).
- Socket side A is on the left in the direction of travel.
- Socket side B is on the right in the direction of travel.



- The battery needs to be inserted tightly into the battery case. Use the foam sections supplied to ensure this.
- To complete, check all vehicle functions.

7.5.3 Correct handling of damaged batteries

CAUTION:

discharging acid can cause skin burns if the battery is damaged:

- *immediately change contaminated or soaked clothing!*

If contact with skin is made:

- *wash off immediately with plenty of water!*

If contact with eyes is made:

- *rinse eyes out under running water for several minutes immediately; call a doctor!*

Requirements:

- protective goggles
- acid-proof gloves
- acid-proof transport container

- If handling damaged batteries, always wear suitable protective clothing.
- Always deposit damaged batteries in suitable acid-proof containers immediately after removal.
- Only transport damaged batteries in suitable acid-proof containers.
- Always wash any objects which were contacted by acid in plenty of fresh water.

Always dispose of used or damaged batteries correctly

Used and damaged batteries will be taken back by your medical equipment supplier or Invacare®.

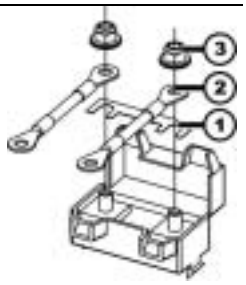
7.6 Checking and replacing the main fuse

CAUTION! Fire hazard!

- *Always use an original strip fuse with the approved amperage.*
- *If the main fuse has blown, first rectify the cause before fitting a new one.*

CAUTION: fitting the incorrect strip fuse causes a fire hazard!

- *Only fix the strip fuses in the sequence shown in the image on the right!*
- *Tighten the nuts with 3.3 to 3.5 Nm!*



1. Strip fuse
2. Spade terminal
3. DIN 6923 nut

Requirements:

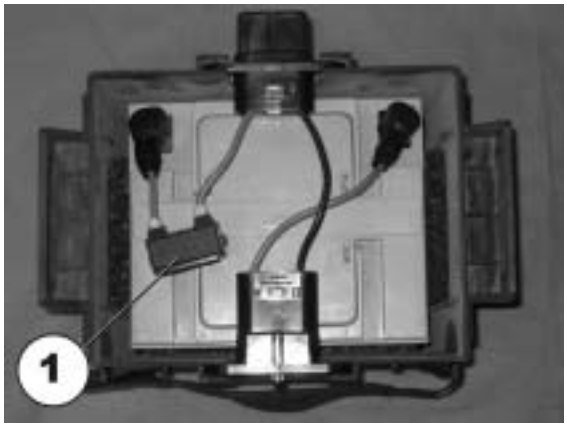
- Phillips screwdriver
- Strip fuse

NOTE:
A spare fuse is located behind the Invacare logo on the rear battery.

NOTE:
If the fuseholder is damaged, you can replace this complete with the battery cables.

- Remove both battery cases as described in Chapter 7.5.1.
- Remove the covers on both battery cases as described in Chapter 7.5.2.

- The fuseholder (1) is located on top of the batteries.
- Open the fuseholder cover.
- If the strip fuse has blown, you must first ascertain and rectify the cause of the fault.
- The main fuse may only be replaced once the fault has been rectified.



- Undo the strip fuse nuts (2) with the Phillips screwdriver.
- Replace the strip fuse.

- Reassembly takes place in the reverse order.
- To complete, check all vehicle functions.

7.7 Checking the cable

The following images show checking the cable using the Shark controller as an example. The plug positions are different for both the DX2 and VR2 controllers. The procedure for checking is otherwise identical.

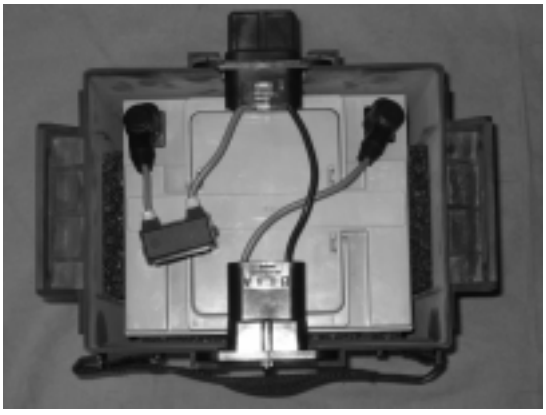
The position of the plugs is described in Chapter 4.2.

- Remove legrests.
- Release seat (1) and tilt forwards.

- Check all cables for visible damage and crushing. Replace damaged cables.
- Pull each plug (1) carefully. The plug should not come out of the socket.
- If the plug is loose, press the plug into the socket with slight pressure. The plug must engage.
- Check whether the plug is now firmly located in the socket, otherwise repeat the previous step.

- Remove both battery cases as described in Chapter 7.5.1.
- Remove the covers on both battery cases as described in Chapter 7.5.2.

- Check all battery cables for visible damage and crushing. Replace damaged cables.



- Reassembly takes place in the reverse order.
- To complete, check all vehicle functions.

7.8 Differences when replacing the REM24 remote

Requirements:
- To adapt the drive program: programming software or hand programming device and REM24 electronics system installation manual, available from Invacare®.

NOTE:
All REM24 remotes are delivered with a standard drive program. If you have carried out customer-specific modifications to the drive program, you will have to make these changes again after installing the new electronics module.

CAUTION: any changes to the drive program can affect the driving characteristics and the tipping stability of the mobility device!
- *Changes to the drive program may only be carried out by trained Invacare® specialist dealers!*
- *Invacare® can only give a warranty for safe mobility device driving behaviour - especially the tipping stability - for unaltered standard drive program!*

7.9 Replacing the steering head bearings on the steering wheels

CAUTION: Injury hazard if the vehicle starts moving unintentionally during repair work!

- *Switch the power supply off (ON/OFF key)!*
- *Engage the drive!*
- *Before raising the vehicle, secure the wheels by blocking them with wedges!*

CAUTION! Incorrect reassembly can damage the bearings and cause the steering wheels to fall out!

- *The single-row angular ball bearing rings are not identical on both sides! There is only one correct way to insert them! For this reason, follow the assembly instructions precisely!*

Tools/parts required:

- open-ended spanner, 19 mm
- Torque wrench
- large screwdriver, flat
- wooden block (approx.12 x 12x 30 cm for propping up vehicle)

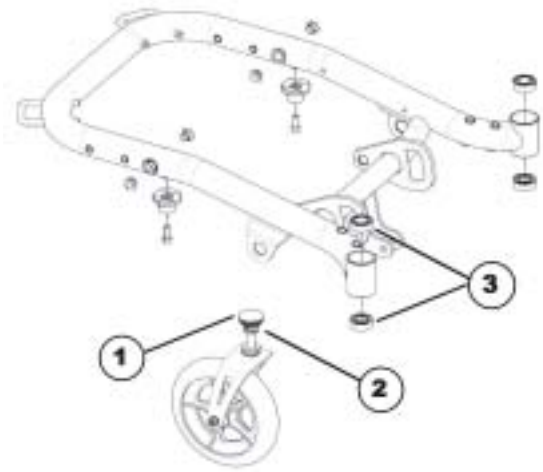
NOTE:
When disassembling, take care of small parts such as screws and washers. Put all small parts down so that they can be reassembled in the right sequence.

- Place the wooden block under the vehicle on the side on which the ball bearing is to be replaced.
- The wheel on the side where the bearing is to be replaced must have enough ground clearance to enable it to be pulled out of the bearing.
- Secure the vehicle against rolling away.

- Carefully remove the plastic cap (1) with the large screwdriver.

- Loosen the 19 mm nut (1) with the socket spanner and remove it. Hold the wheel so that it does not rotate when the nut is being removed.
- Pull the steering head shaft upwards out of the steering head tube.
- Take the washers out of the tube.
- Take the ball bearing out of the tube.

- The adjacent figure shows an overview of the individual parts.
- Plastic cap
- 19 mm nut
- Ball bearing



- Reassembly takes place in reverse order to disassembly
- Ensure that you insert the ball bearings exactly as described below.
- Also ensure that the washers are correctly replaced.

IMPORTANT ASSEMBLY INFORMATION!

- *The bearings must always be assembled so that the narrow borders of the ball bearings are facing each other (inside)!*
- *The steering head bolts and nuts must always be pressing against the wide (outside) border of the ball bearings! Otherwise, the bearings will be pressed apart and damaged by the bolts!*

The illustrations show the wide border of the ball bearing on the outside of the ball race (A) and the narrow ball bearing edge on the inside (B).

After assembly, the steering wheels should rotate freely but the bearings should have no play.

- First tighten the nuts to 20 Nm +/- 2 Nm.
- Then loosen them slightly.
- Then retighten to 15 Nm +/- 1.5 Nm.

7.10 Repairing punctures

CAUTION: Injury hazard if the vehicle starts moving unintentionally during repair work!

- *Switch the power supply off (ON/OFF key)!*
- *Engage the drive!*
- *Before raising the vehicle, secure the wheels by blocking them with wedges!*

7.10.1 Repairing punctures (wheel size 3.00-8")

Requirements:

- Torx TX40 spanner
- Allen key 5 mm
- Repair kit for tyre repair **or** a new inner tube.
- Talcum powder

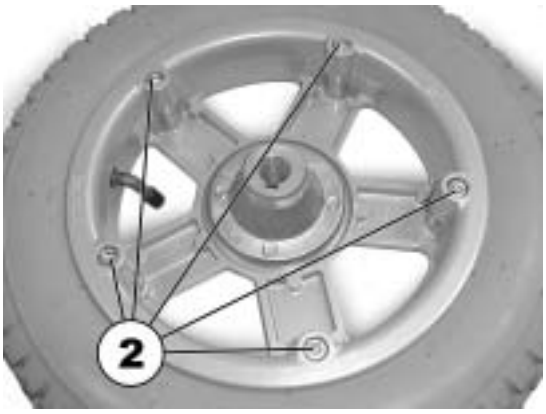
Removing the wheel

- Block up the vehicle (place wooden blocks under frame).
- Unscrew the TX40 countersunk screw (1).
- Pull the wheel off the axle.

NOTE:
Re-assembly is done in reverse order. Ensure that the tyre is replaced on the same side and in the same travel direction as it was previously mounted.

Repairing the flat tyre

- Unscrew valve cap.
- Depressurise tyre by pressing in the pin in the valve .
- Unscrew the 5 Allen screws (back of the wheel, 2).
- Remove the rim halves from the tyre.
- Remove the inner tube from the tyre.
- Repair inner tube and replace, or insert new.



NOTE:
If the old inner tube is to be repaired and re-used, and has become wet during repair, you can make replacement easier by sprinkling the inner tube with a little talcum powder.

- Insert the wheel rim halves from outside into the tyre.
- Pump a little air into the inner tube.
- Insert the Allen screw once again, and screw the wheel rims together tightly.
- Ensure that the tyre outer is seated correctly.
- Pump the tyre up to the prescribed pressure.
- Check that the tyre is seated correctly once again.
- Screw the valve cap back on.
- Refit the wheel.

7.10.2 Repairing punctures (wheel size 280/250-4)

Requirements:
- Allen key 6m
- jaw spanner 13 mm
- 2 x small ring spanners or flat screwdrivers (for pulling off tyres)
- Repair kit for tyre repair **or** a new inner tube.
- Talcum powder

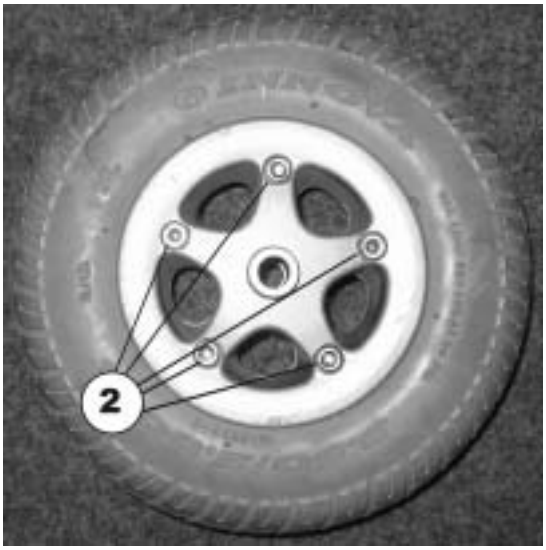
Removing the wheel

- Block up the vehicle (place wooden blocks under frame).
- Undo the bolt (1) and remove it using the Allen key on one side and the jaw spanner on the other (as a counter).
- Pull the wheel out of the fork.

NOTE:
Re-assembly is done in reverse order. Ensure that the tyre is replaced on the same side and in the same travel direction as it was previously mounted.

Repairing the flat tyre

- Unscrew valve cap.
- Depressurise tyre by pressing in the pin in the valve .
- Unscrew the 5 Allen screws (back of the wheel, 2).
- Remove the rim halves from the tyre.
- Remove the inner tube from the tyre.
- Repair inner tube and replace, or insert new.



NOTE:
If the old inner tube is to be repaired and re-used, and has become wet during repair, you can make replacement easier by sprinkling the inner tube with a little talcum powder.

- Put the tyre back on the rim.
- Ensure that the tyre outer is seated correctly.
- Pump the tyre up to the prescribed pressure.
- Check that the tyre is seated correctly once again.
- Screw the valve cap back on.
- Refit the wheel.

7.11 Replacing a drive wheel

CAUTION! Danger of mobility device tipping or rolling away!

- *Prevent the mobility device tipping by propping it up on a wooden block which is long and wide enough under the battery case! If the wooden block is too short or too high, the mobility device can still tip!*
- *Switch the mobility device off at the remote!*

Tools/parts required:

- Torx TX40 spanner
- wooden block (approx.12 x 12x 30 cm) for propping up vehicle

NOTE:
Take careful note of small parts and the sequence in which components are fitted. Arrange these carefully so that they are always refitted in the correct sequence.

- Remove legrests.
- Release seat (1) and tilt forwards.
- Disconnect the remote bus cable from the electronics module or ACT.
- Lift the seat out of the front anchorage and remove it. When doing so, get the help of a second person because the seat is heavy.

- Remove both battery cases as described in Chapter 7.5.1.
- Place the vehicle upside down so that the wheels are facing upwards. When doing so, get the help of a second person because the vehicle is heavy.

- Under the 4 bolts which secure the wheel (1) using the Torx TX40 spanner.
- Remove the wheel from the hub.

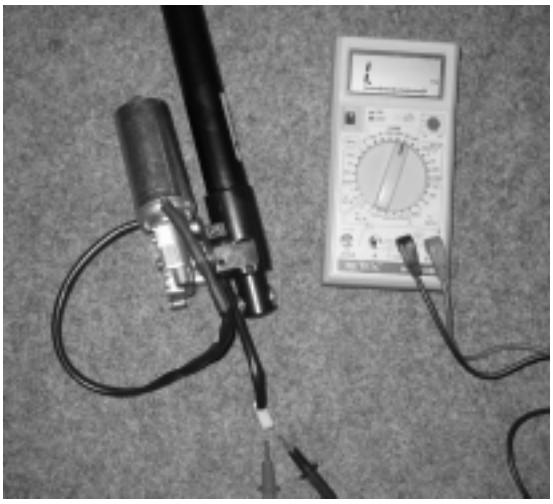
- Reassembly takes place in the reverse order.

7.12 Checking an adjusting motor

Tools/parts required:
- Multimeter

- Remove legrests.
- Release seat (1) and tilt forwards.
- Remove the adjusting motor plug from the electronics module or ACT (see Chapter 4.2.

- Check the electrical resistance at the adjusting motor plug (1).
  The plug may have a different shape to that shown in the picture.
- If the resistance is close to infinity, the motor is probably burnt out.
- If the resistance is below 1 Ω, the motor has a short-circuit.
- The motor must be replaced in both cases.



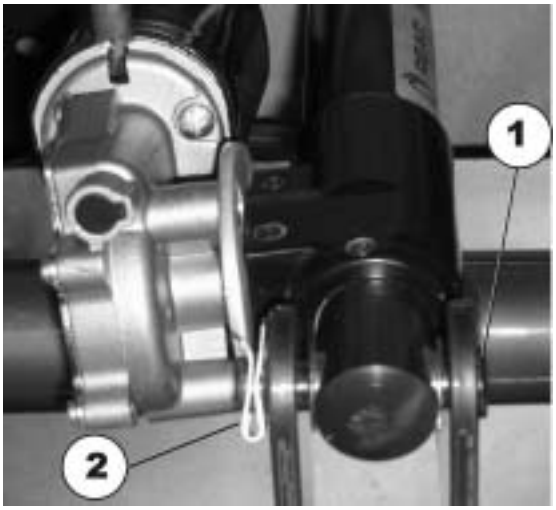
7.13 Replacing the seat tilting

Requirements:
- flat screwdriver, blade width approx. 6 mm
- oblique pliers
- small hammer
- cable binder

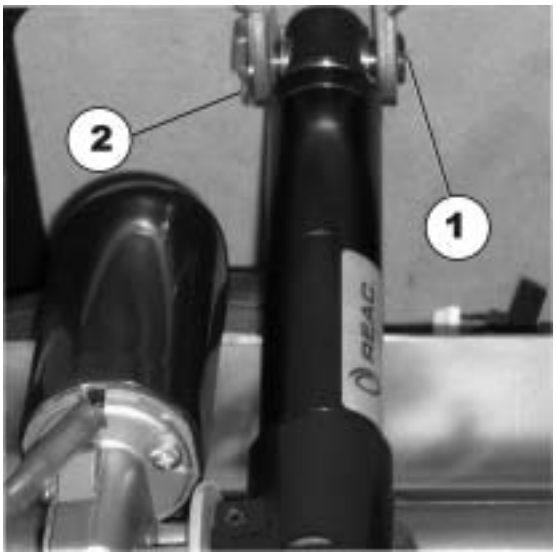
- Remove legrests.
- Release seat (1) and tilt forwards.
- Disconnect the remote bus cable from the electronics module or ACT.
- Lift the seat out of the front anchorage and remove it. When doing so, get the help of a second person because the seat is heavy.

- Remove both battery cases as described in Chapter 7.5.1.
- Pull the adjusting motor plug out of the electronics module.
- The adjusting motor cable is secured inside the frames with cable ties. Remove the cable ties with the oblique pliers.

- Remove the SL fuse (2) on the bottom fixing bolt (1) with the screwdriver.
- Pull the fixing bolt (1) out.



- Remove the SL fuse (2) on the top fixing bolt (1) with the screwdriver.
- Pull the fixing bolt (1) out.



- Pull the adjustment spindle with adjusting motor out.
- Insert a new adjustment spindle with adjusting motor.
- Reinsert the fixing bolts and SL fuses. Fix the SL fuses securely to the fixing bolt with the hammer.
- Reinsert the adjusting motor plug into the electronics module.
- Secure the adjusting motor cable to the frame with cable ties. The cable must be routed so that it does not rub or get trapped.
- To complete, check all seat tilting functions.

8 Adjusting the seat depth to the user's seating position

In order to adapt the mobility device optimally to the requirements of the user, we recommend that you ask your authorised Invacare® the dealer toadjust the seat depth individually.

Adapting the seat to the user's seating position depends on which seat has been fitted, and should be carried out in the following sequence.

1. Adjust the seat depth to the seat frame.
2. Adjust the seat area.
3. Check to ensure that the steering wheels can rotate freely
4. Repeat steps 1 to 3 if necessary

A seat frame with a range of threaded holes is located under the seat. Depending on which seat which has been fitted, it can be adjusted to various locations on the seat frame which defines the seat depth.

In addition, you can move the seating area and fix it in different positions.

CAUTION! Injury hazard

- *The steering wheels must rotate freely and may not contact any fixed mobility device components.*
  Always check the seat depth settings for both forward and reverse movement.

What needs to be observed when adjusting the seat depth?
If the seat depth is too short, the force required when the user stands up is too high. If the seat depth is set too long, the user may "slump down" while getting up.

Requirements:

- Allen key 5 mm

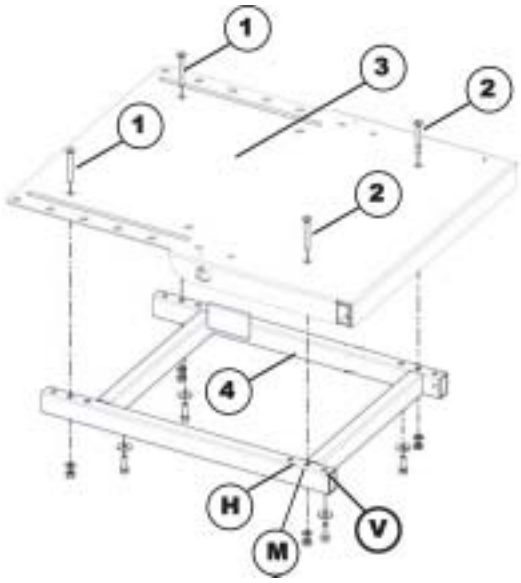
8.1 Standard seat

The pictures show the standard seat from above and below.

- Rear bolts (1)
- Front bolts (2)
- Seat plate (3)
- Seat frame (4)

The seat plate can be fixed in three different positions on the seat frame.

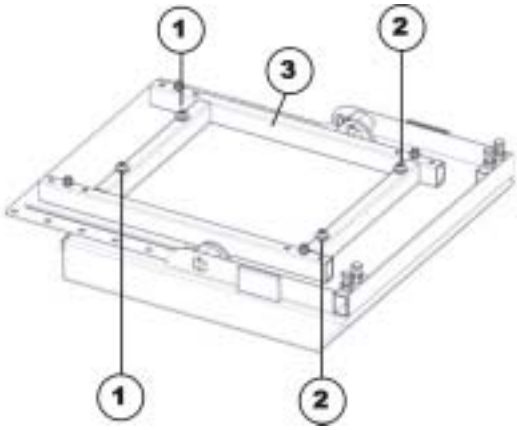
- Front fixing (V)
- Centre fixing (M)
- Rear fixing (H)



The picture shows where the drillholes for fixing the seat frame (3) are located on the base frame.

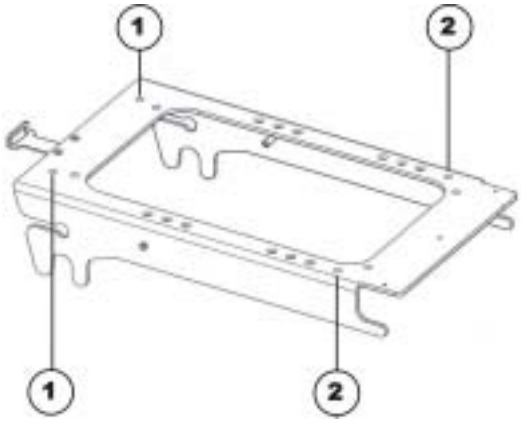
- Rear drillholes (1)
- Front bolts (2)

The seat frame can only be fixed in one position on the base frame.



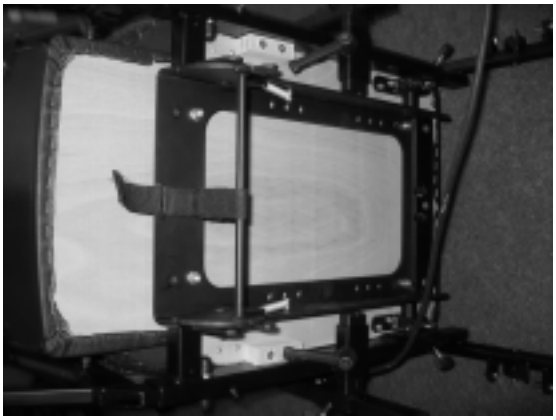
The picture shows the seat frame with the drillholes for the standard seat.

- Rear drillholes (1)
- Front drillholes (2)



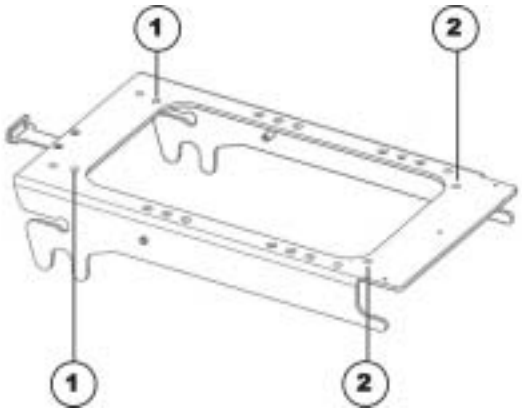
8.2 Fixed seat

The picture shows the fixed seat from below.



The fixed seat is fixed directly to the base frame.

- Rear drillholes (1)
- Front drillholes (2)



8.3 Flex-II seat

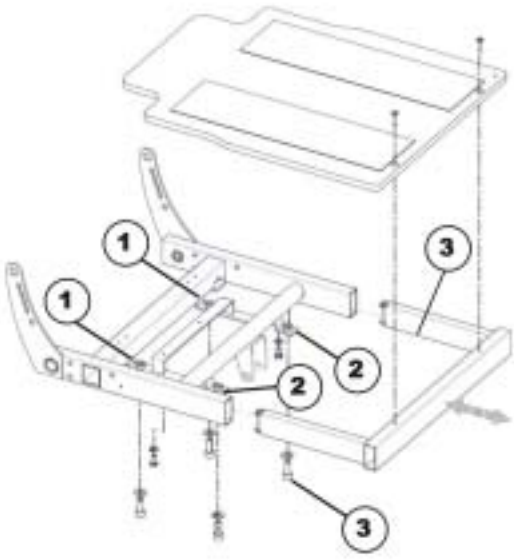
The pictures show the standard seat from above without seat support.

The Flex-II seat is fixed directly to the base frame.

- Rear drillholes (1)
- Front drillholes (2)

To adjust the seat depth, proceed as follows:

- Loosen screws (3)
- Push the front seat section forwards or backwards
- Retighten the screws (3)



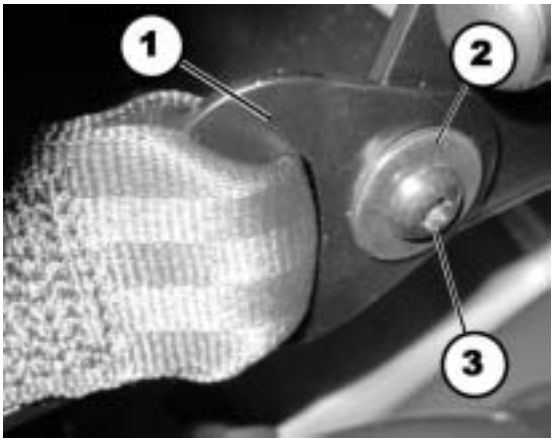
9 Replacing the holding strap

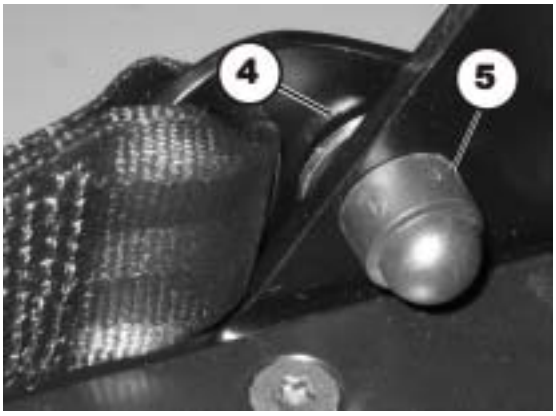
9.1 Standard seat & Flex II

Requirements:
- open-ended spanner, 13 mm
- 5 mm Allen key

Note
A nut is fixed between the two washers (2) and (4) as a spacer so that the belt mounting can rotate freely.

- Remove the plastic cap (5).
- Loosen the bolt (3) and the associated nut (in the figure this is covered by the plastic cap) with a 5 mm Allen key and a 13 mm socket spanner.
- Remove the nut.
- Remove the bolt including safety belt and flat washers (2) and (4).
- Remove the flat washers (4).
- Replace the safety belt (1).
- Refit the parts in the reverse order.





9.2 Fixed seat unit

Requirements:
- open-ended spanner, 13 mm
- 13 mm jaw spanner

- Loosen the bolt (1) with a 13 mm socket spanner. Hold the nut using a 13 mm jaw spanner to prevent rotation (not visible in figure).
- Remove the bolt together with the flat washer (3), the safety belt (4) and the spacer (2).
- Replace the safety belt (1).
- Refit the parts in the reverse order.